

FEM 1.209:050067/986

JAN 10 1986

COMPLETED 23

FLOOD INSURANCE STUDY



ORIGINAL

CITY OF DUMAS,
ARKANSAS
DESHA COUNTY



APRIL 2, 1986



Federal Emergency Management Agency

COMMUNITY NUMBER - 050067

BEST COPY AVAILABLE

mlb

TABLE OF CONTENTS

	<u>Page</u>
1.0 <u>INTRODUCTION</u>	1
1.1 Purpose of Study	1
1.2 Authority and Acknowledgements	1
1.3 Coordination	1
2.0 <u>AREA STUDIED</u>	2
2.1 Scope of Study	2
2.2 Community Description	2
2.3 Principal Flood Problems	4
2.4 Flood Protection Measures	4
3.0 <u>ENGINEERING METHODS</u>	4
3.1 Hydrologic Analyses	5
3.2 Hydraulic Analyses	6
4.0 <u>FLOOD PLAIN MANAGEMENT APPLICATIONS</u>	6
4.1 Flood Boundaries	7
4.2 Floodways	7
5.0 <u>INSURANCE APPLICATION</u>	10
5.1 Reach Determinations	10
5.2 Flood Hazard Factors	10
5.3 Flood Insurance Zones	12
5.4 Flood Insurance Rate Map Description	12

ABLE OF CONTENTS - continued

	<u>Page</u>
6.0 <u>OTHER STUDIES</u>	12
7.0 <u>LOCATION OF DATA</u>	13
8.0 <u>BIBLIOGRAPHY AND REFERENCES</u>	13

FIGURES

Figure 1 - Vicinity Map	3
Figure 2 - Floodway Schematic	9

TABLES

Table 1 - Summary of Discharges	5
Table 2 - Floodway Data	8
Table 3 - Flood Insurance Zone Data	11

EXHIBITS

Exhibit 1 - Flood Profiles	
Ditch No. 6	Panel 01P
Canal No. 19	Panel 02P

Exhibit 2 - Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
CITY OF DUMAS, ARKANSAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Dumas, Desha County, Arkansas, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in their efforts to promote sound flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The original hydrologic and hydraulic analyses for this study were prepared by Garver & Garver, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. H-4746. This study was completed in March 1979. A revised study was prepared by Dewberry & Davis under agreement with FEMA. This study was completed in September 1984.

1.3 Coordination

On April 6, 1978, an initial Consultation and Coordination Officer's (CCO) meeting, attended by representatives of the City of Dumas, Garver & Garver, Inc. (the study contractor), and FEMA, was held to identify streams to be studied by detailed methods.

A final CCO meeting was held on December 12, 1979, to review the results of the study. This meeting was attended by representatives of the city, the study contractor, and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Dumas, Desha County, Arkansas. The area of study is shown on the Vicinity Map (Figure 1).

Floods caused by the overflow of Ditch No. 6, between State Route No. 54 and State Route No. 159, and Canal No. 19, adjacent to the corporate limits, were studied by detailed methods. This study was revised to incorporate changes to the corporate limits due to annexations, including revising flood boundaries at Canal No. 19 on the eastern boundary of the community. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

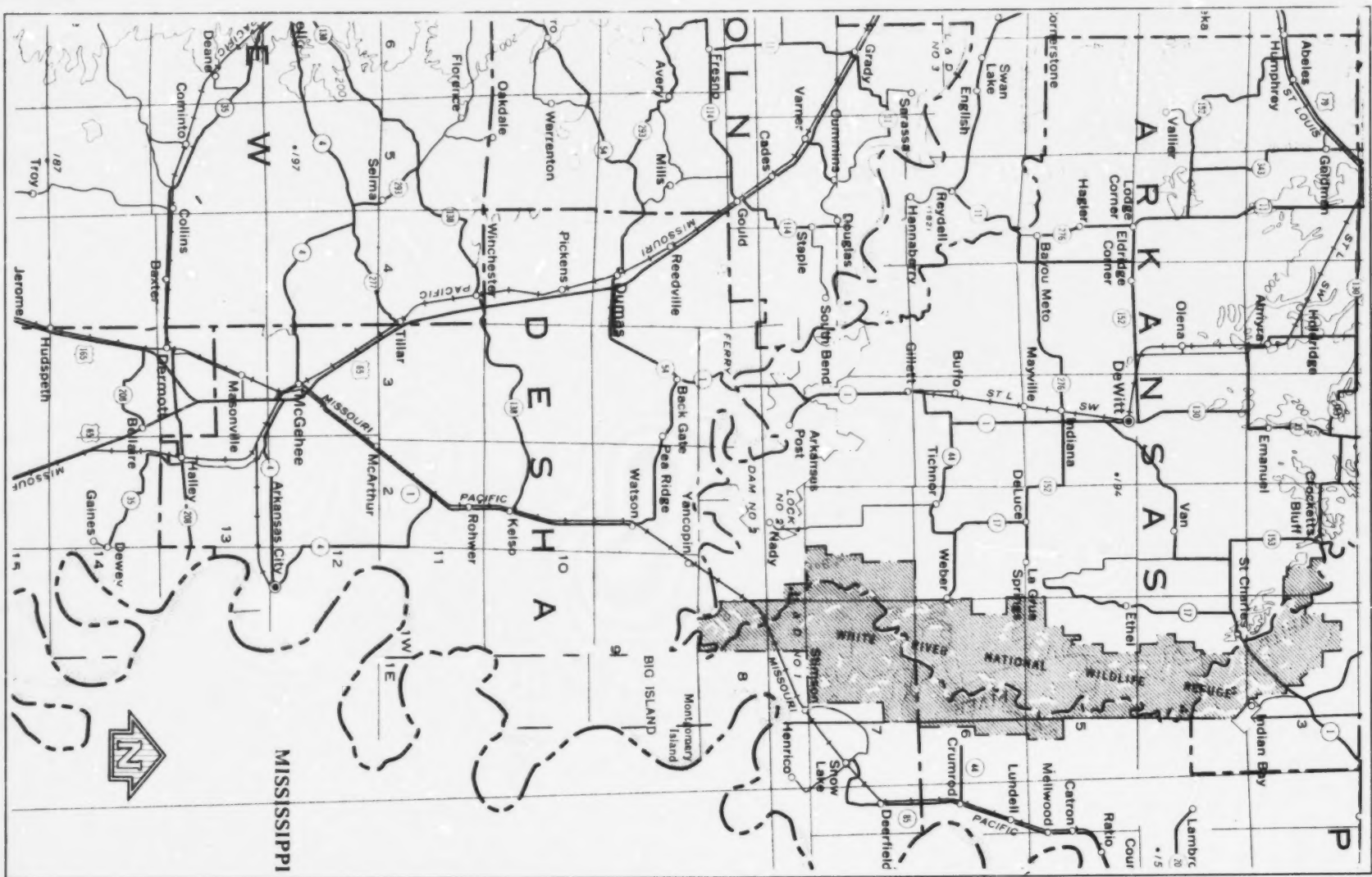
Portions of Ditch No. 6 and two unnamed tributaries were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the City of Dumas.

2.2 Community Description

The City of Dumas is located in northwest Desha County near the intersection of Arkansas State Route No. 54 and U. S. Route No. 65. The community is served by the Missouri Pacific Railroad and was named for its founder, Mr. W. B. Dumas, an engineer who helped survey the railroad right-of-way. The railroad is said to have been built through this area around 1870. The community was started during the same period, with early business in the area centered around timber. Large sections of land were cleared when the timber was cut. This land later developed into the fertile farm land surrounding Dumas (Reference 1).

In 1890, fewer than 100 people lived in Dumas; however, the community was beginning to grow. Dumas was incorporated in 1904, and the city has grown steadily since that time. The 1970 population of the city was estimated at 4,600 (Reference 2). Today Dumas is a growing community with over 5,000 people. Its economy is balanced between agriculture and light industry. Leading agricultural crops in the area include cotton, soybeans, rice, and other small grains. Manufacturer products range from clothing to farm machinery.

The average annual temperature for Dumas is 63.5 degrees Fahrenheit (°F). Annual rainfall is approximately 50 inches, and snowfall averages less than one foot (Reference 3).



FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF DUMAS, AR
(DESHA CO.)

APPROXIMATE SCALE



VICINITY MAP

FIGURE 1

BEST COPY AVAILABLE

The terrain of Dumas is nearly level with poorly and well drained loamy soils. The runoff from this area tends to be slow, and the soils tend to have a low permeability (Reference 4). Dumas is drained by the Choctaw Bayou to the west and Canal No. 19 to the east. Most of the drainage from Dumas flows in ditches to Canal No. 19.

Ditch No. 6 is located along the northwest boundary of Dumas and carries drainage from the north and east side of Dumas to Ditch No. 5 at State Route No. 159. Ditch No. 5 flows to the east and enters Canal No. 19, part of the Cypress Creek Basin. Cypress Creek flows south to the central portion of Desha County where it enters Bayou Macon. Bayou Macon continues south into Chicot County where it enters the Boeuf River Basin. The Boeuf River flows south through Desha County and Chicot County, crossing into Louisiana. Water from the Boeuf River enters the Mississippi River by the Ouachita, Black, and Red Rivers.

2.3 Principal Flood Problems

The flat terrain and low permeability of soils over the study area slow drainage and causes shallow flooding over large areas. Railroad embankments, highway embankments, and undersize bridges and culverts also act to impede runoff, which increase the risk of shallow backwater flooding over large areas. Since the drainage areas of the ditches in Dumas are relatively small, most flooding is caused by local rainfall.

2.4 Flood Protection Measures

Flood protection measures in the study area have been limited to the cleaning and excavation of existing ditches and the construction of supplementary ditches to help speed and contain local runoff.

Canal No. 19 east of Dumas is a portion of the Boeuf River Basin which was excavated by the U. S. Army Corps of Engineers (COE). Ditch No. 5, Ditch No. 6, and Ditch No. 7 are Soil Conservation Service (SCS) projects. These projects were all completed in the late 1950's and early 1960's.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2,

1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

Drainage areas along Ditch No. 6 were measured from U. S. Geological Survey (USGS) topographic maps (Reference 5). Synthetic storms were computed to define the discharge-frequency data for Ditch No. 6. Rainfall distribution for the 10-, 50-, and 100-year frequencies were computed from rainfall frequency data contained in Weather Bureau Technical Paper No. 40 (Reference 6). Snyder's coefficients were used to compute hydrographs. The hydrographs and rainfall distributions were used to compute synthetic storms of the desired frequencies from which the peak discharges were obtained. A log-probability relationship of the lower frequency peak discharges was used to compute each of the 500-year peak discharges.

Hydrologic information for Canal No. 19 was taken from a Special Flood Hazard Information Report done by the COE (Reference 7).

A summary of the drainage area-peak discharge relationships for Ditch No. 6 is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (sq. miles)</u>	<u>PEAK DISCHARGES (cfs)</u>			
		<u>10-YEAR</u>	<u>50-YEAR</u>	<u>100-YEAR</u>	<u>500-YEAR</u>
DITCH NO. 6					
At Missouri Pacific					
Railroad	2.26	357	464	489	560
At Cross Section C	1.23	268	366	405	515
At State Route 54	1.03	239	311	344	455

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Below water sections of channels, bridges, and culverts were obtained by field surveys. Additional information was obtained from topographic maps of the study area (Reference 5).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness coefficients (Manning's "n") for streams in this study were estimated by field inspection. Roughness coefficients of 0.06 in the channel and 0.10 to 0.12 in the flood plains were used for all floods.

Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 8). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. The computed profiles were checked for reasonability by comparing them with existing high-water marks.

Approximate water-surface profiles for Canal No. 19 were developed from gage data provided by the Vicksburg District of the COE (Reference 7). Profiles were developed for the 10-, 50-, and 100-year floods (Exhibit 1). Profiles were not developed for the 500-year flood since stage-frequency information was not available beyond the 100-year frequency.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For Ditch No. 6, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps (Reference 5). Only the 100-year flood boundary has been shown along Canal No. 19, since the 500-year stage-frequency was not available.

For the 100-year flood boundaries for the approximate flooding were delineated using the previously effective Flood Insurance Study for the City of Dumas (Reference 9). Approximate flood boundaries were terminated where adequate topographic data were not available.

The 100- and 500-year flood plain boundaries are shown on the Flood Boundary and Floodway Map (Exhibit 2). In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodway in this study is presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this study was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for the stream segment for which a floodway is computed (Table 2). No floodway was determined for Canal No. 19.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ²	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE
Ditch No. 6								
A ¹	0.000	30	201	2.3	163.7	163.7	164.7	1.0
B ¹	0.010	42	271	1.7	163.8	163.8	164.8	1.0
C ¹	0.165	400	991	0.4	163.9	163.9	164.9	1.0
D	0.365	400/40 ³	867	0.4	164.0	164.0	165.0	1.0
E	0.545	400/150 ³	915	0.3	164.2	164.2	165.2	1.0
F	0.615	250	516	0.6	164.2	164.2	165.2	1.0

¹Outside corporate limits²Miles above State Route 159³Width/width within corporate limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

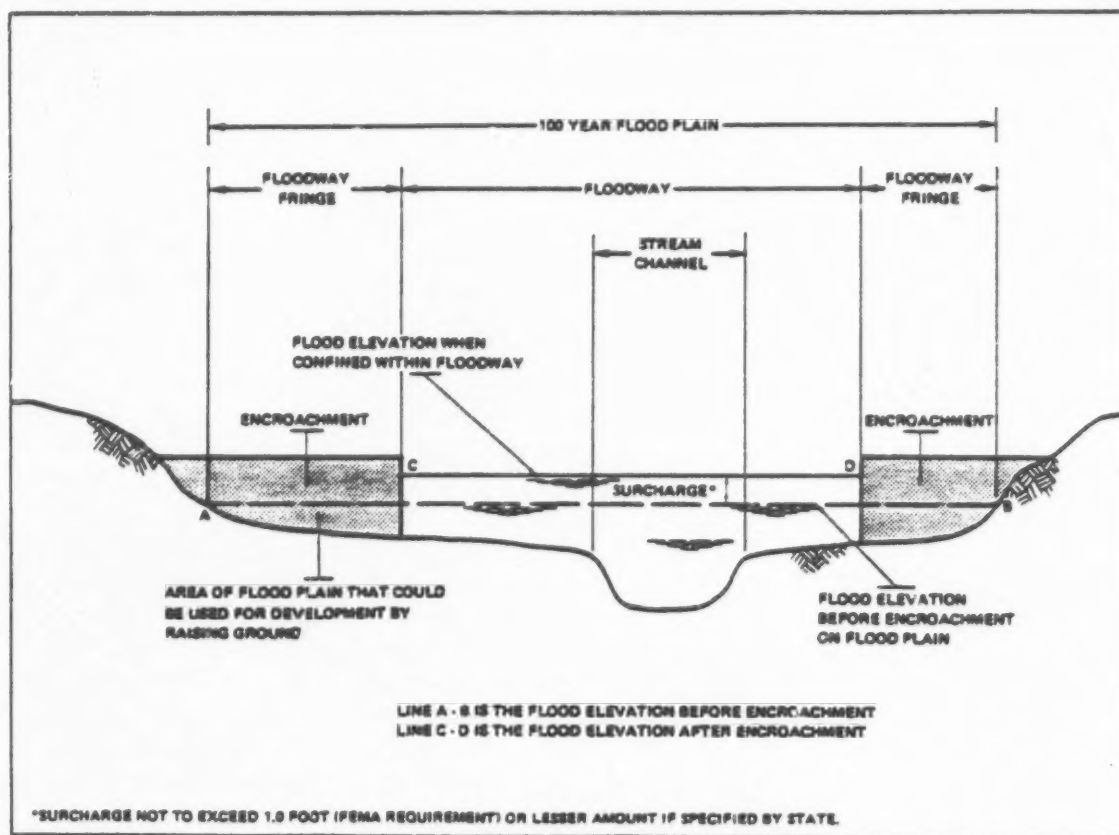
CITY OF DUMAS, AR
(DESHA CO.)

FLOODWAY DATA

DITCH NO. 6

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year flood plain boundaries are either close together or collinear, only the

The area between the floodway and 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.



FLOODWAY SCHEMATIC

Figure 2

5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail in the City of Dumas.

5.1 Reach Determinations

Reaches are defined as sections of flood plain that have relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference may not have a variation greater than that indicated in the following tabulation for more than 20 percent of the reach:

<u>Average Difference Between 10- and 100-Year Floods</u>	<u>Variation</u>
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding sources of the City of Dumas are shown on the Flood Profiles (Exhibit 1) and summarized in Table 3.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then used with depth-damage relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations rounded to the nearest one-half foot, multiplied by 10, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, it is rounded to the nearest whole foot.

FLOODING SOURCE	PANEL ¹	ELEVATION DIFFERENCE ² BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ³ ELEVATION (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Ditch No. 6 Reach 1	05	-0.34	-0.07	+0.18	005	A1	Varies
Canal No. 19 Reach 1	05	-2.27	-0.62	*	025	A5	Varies

¹Flood Insurance Rate Map Panel

*Not determined

²Weighted Average³Rounded to the nearest foot - see map

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF DUMAS, AR
(DESHA CO.)

FLOOD INSURANCE ZONE DATA

DITCH NO. 6 - CANAL NO. 19

5.3 Flood Insurance Zones

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is associated with each possible FHF, and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

- Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
- Zones A1 and A5: Special Flood Hazard Areas inundated by the 100-year flood; with base flood elevations shown, and zones subdivided according to FHFs.
- Zone B: Areas between the Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- or 500-year floods by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
- Zone C: Areas of minimal flooding; not subdivided.

Flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding sources studied in detail in the community are shown in Table 3.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Dumas is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations. Base flood elevation lines show the locations of the expected whole-foot water-surface elevation of the base (100-year) flood. The base flood elevations and zone numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the National Flood Insurance Program.

6.0 OTHER STUDIES

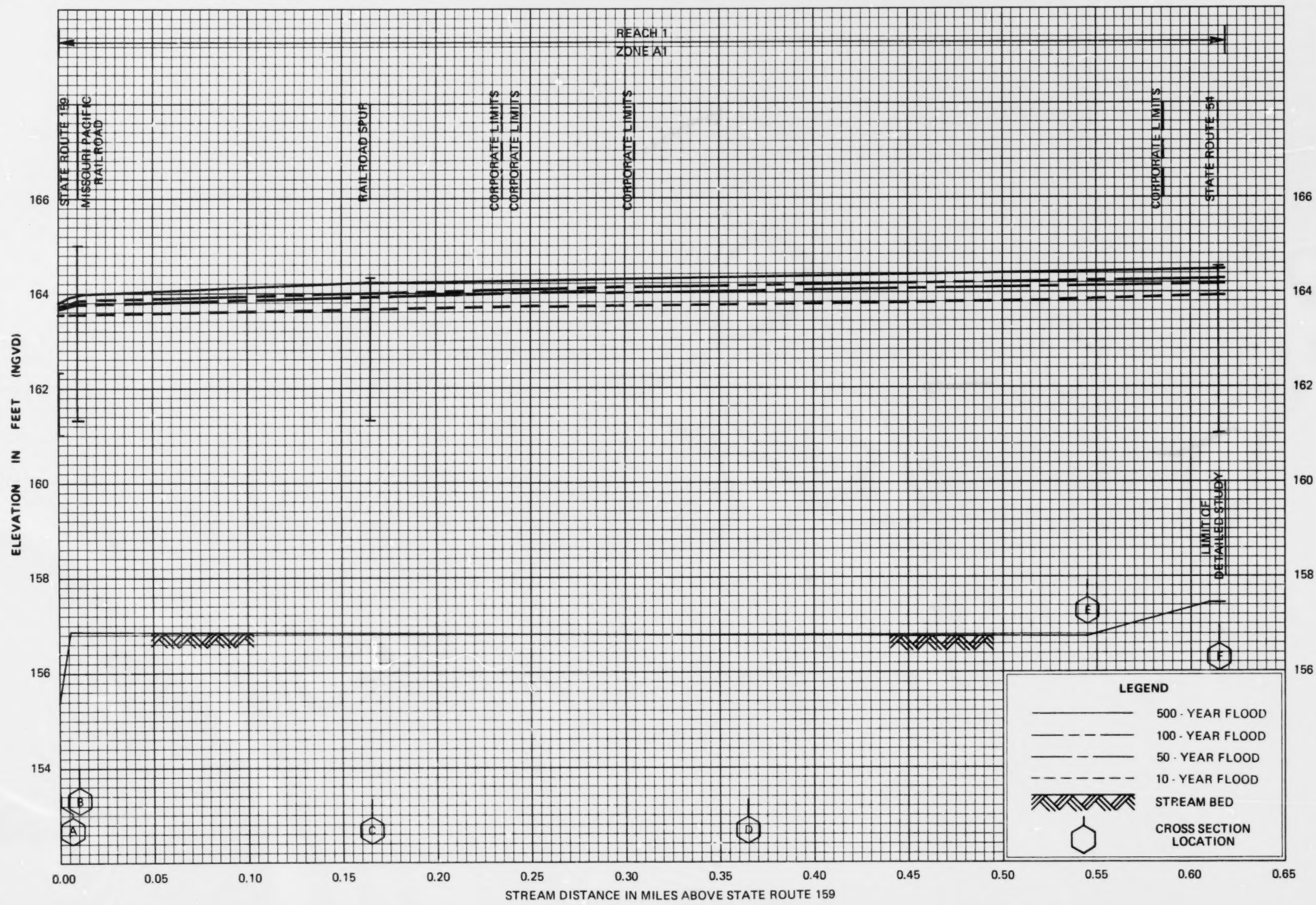
This Flood Insurance study supersedes the previously effective study for the City of Dumas (Reference 9).

7.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Regional Director, Region VI Office, Federal Center, Denton, Texas 76201.

8.0 BIBLIOGRAPHY AND REFERENCES

1. T. N. Eastham, Dumas, Then and Now, Arkansas, January 1972.
2. Arkansas Municipal League, Population Growth of Arkansas' Towns and Cities, 1940 to Present, Arkansas, 1978.
3. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Climatography of the United States, No. 81, Washington, D. C., 1973.
4. U. S. Department of Agriculture, Soil Conservation Service, Soil Survey of Desha County, Arkansas, Washington, D. C., 1972.
5. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 5 Feet: Gould Arkansas, 1964; Winchester, Arkansas, 1969; Dumas, Arkansas, 1969.
6. U. S. Department of Commerce, Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, Washington, D. C., 1961, Revised 1963.
7. U. S. Army Corps of Engineers, Vicksburg District, Special Flood Hazard Information Report, Canal 19 (Boeuf River) at Gould-Dumas, Arkansas, Vicksburg, Mississippi, February 1972.
8. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Users Manual, Davis, California, November 1976.
9. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Dumas, Desha County, Arkansas, Washington, D. C., May 19, 1980.

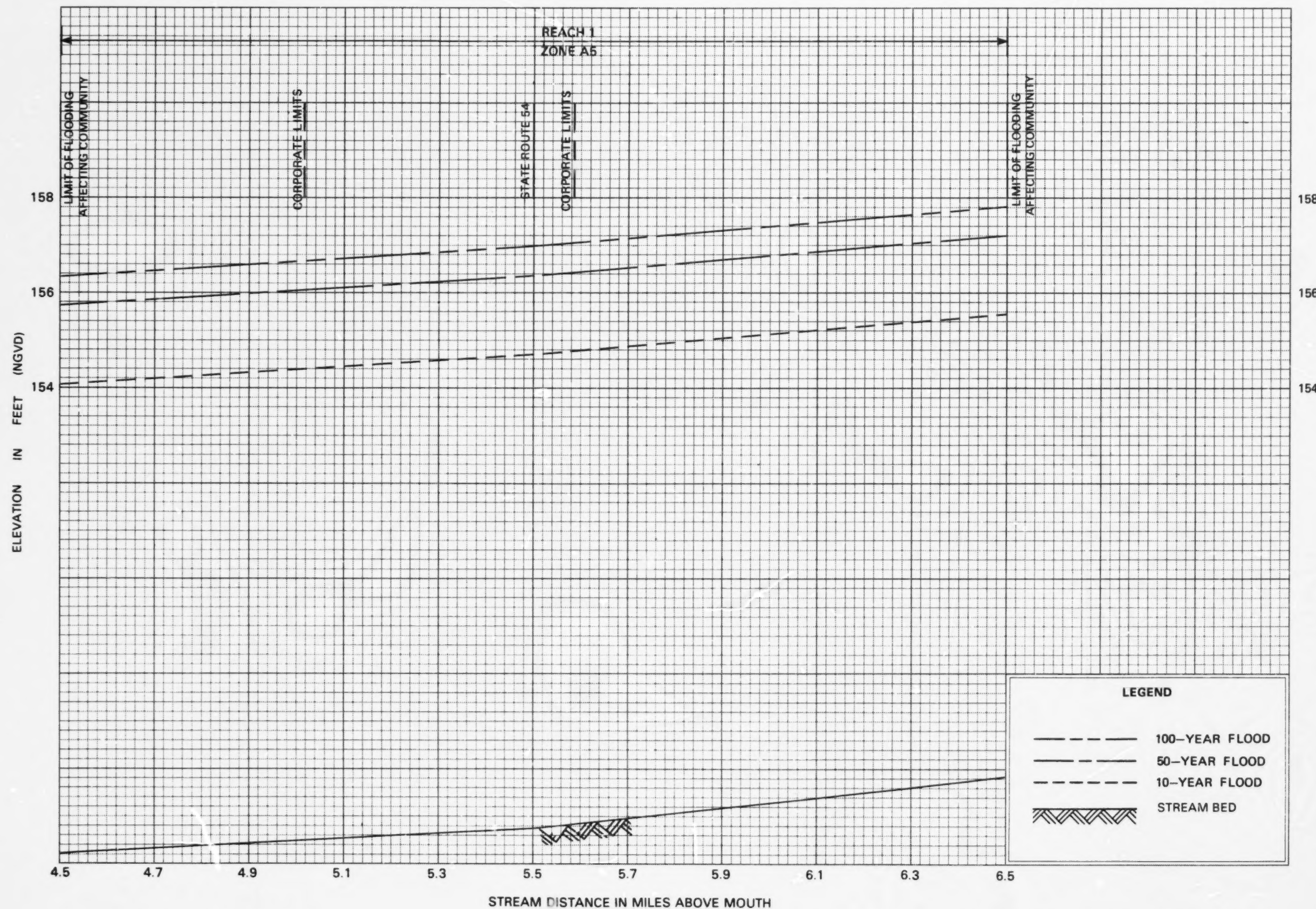


FLOOD PROFILES

DITCH NO. 6

FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF DUMAS, ARKANSAS
(DESHA CO.)

01P



FLOOD PROFILES

CANAL NO. 19

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF DUMAS, AR
(DESHA CO.)

02P

BEST COPY AVAILABLE

15